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Remarks

Claims 1-18 and 33-46 remain in the application. The non-elected claims have been canceled.

The Examiner objects to claim 1 and believes that "step" should be made plural. This purely editorial change has been made.

The Examiner has rejected claim 34 under 35 U.S.C. §112, ¶1 because, he states, the specification does not provide what the term "glass forming agent" encompasses. Although the term "glass forming agent" is not used in the specification, Applicants believe that its meaning is well understood in the art. Nonetheless, claim 34 and some of its dependent claims have been amended to change to the term "silica bridging agent" approved by the Examiner.

The Examiner has rejected claims 34 under 35 U.S.C. §112, ¶2 because of the lack of antecedent basis for "said two silicon parts" and because "glass forming agent" is unclear as to what it encompasses. The antecedent basis has been provided by the amended title, as suggested by the Examiner without any real change in meaning of the claim. The amendment to "silica bridging agent" should make claim 34 adequately clear. Accordingly, this rejection should be removed.

The Examiner has rejected claims 1, 2, 4, 5, and 33-35 under 35 U.S.C. §102(b) as being anticipated by Stokes et al. (U.S. Patent 3,822,348, hereafter Stokes). This rejection is traversed. Stokes describes bonding together two silicon nitride parts. The claimed silicon part is not a silicon nitride part, as would be well understood by the ordinary mechanic reading the Stokes and interpreting the present claims. Silicon nitride has an approximate composition of Si_3N_4 , that is, more nitrogen than silicon so that it should not be referred to as silicon. The ordinary mechanic easily distinguishes a silicon part from a silicon nitride part. Applicants distinguish in the paragraph bridging pages 1 and 2 their silicon members from the quartz and silicon carbide members of conventional towers, which materials also containing silicon. Applicants provide at the bottom paragraph on page 2 an example of silicon members composed of CVD grown silicon. U.S. Patent 6,450,346, which is incorporated by reference into the

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present application, provides further examples of silicon members distinguished from SiC and quartz. Applicants have adequately defined a silicon member to exclude a silicon nitride member, as is well understood by the ordinary mechanic in the art.

New dependent claims 39-41 further specify the composition or formation of the silicon member. Claim 35 has been amended to similarly recite this feature. The support for the limitation of claim 39 is found at page 2, line 23. The support for the limitation of claims 35 and 41 is found at page 14, line 20. It is noted that silicon nitride members are most usually formed by sintering or other high temperature processes.

Further, Stokes does not disclose the combination of silicon powder and a silica bridging agent. Stokes' powdered glass is not silicon but is a silicate glass also containing alumina and magnesium oxide. Even Stokes makes the distinction between silicate glass and metallic silicon. Again, the ordinary mechanic knows the difference between a powder of silicon and a powder of silicate glass. Further, the claim requires two elements, the silicon powder and the silica forming agent so clearly two different elements are being claimed. In contrast, Stokes discloses only the single element of a silicate glass powder. A new dependent claim 38 specifies the oxygen limit of the silicon powder, as supported at page 12, line 12. A silicate glass powder does not satisfy this limit.

Claim 34 further requires that the heating converts the silica bridging agent into a glass. In contrast, Stokes heats his glass powder to melt it. His glass powder is not converted into a glass but is already a glass.

New dependent claim 41 requires that the annealing temperature be between 1000°C and 1300°C, as supported at page 12, line 9. This is far below the 1600°C required for melting Stokes' glass powder. New dependent claim 42 requires the mixture to form a liquid, as supported at page 7, line 4. Stokes nowhere describes his mixture as a liquid but characterizes it as a putty.

The Examiner has rejected claims 1-8, 12-14, 18, and 33-36 under 35 U.S.C. §103(a) as being obvious over the admitted prior art (APA) in view of Kurz (U.S. Patent 3,707,386). This rejection is traversed. The Examiner would add the silicon dust of Stokes to the silica forming agent of the APA to increase the SiO₂ content. This argument lacks technical justification. The

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silica forming agent of the APA consists essentially of SiO_2 after curing. Adding silicon power to the silica forming agent of the APA would decrease the fraction of SiO_2 in the cured mixture, contrary to the effect taught by Kurz. Kurz's technical argument at col. 1, line 59 to col 2, line 2 for including metallic silicon is based on correcting an SiO_2 -deficient water glass (NaSiO). As stated above, the silica glass formed in the APA is not deficient in SiO_2 and no art has been shown for such a quality. The Examiner further states that the silicon powder is obviously added to better resist moisture. No art has been shown for the water sensitivity of the spin-on glass of the APA, which would benefit from better moisture resistance. On the contrary, it is well known that silica in general is very resistant to water as evidenced by the widespread use of quartz laboratory glassware.

Yet further, Kurz seems uncombinable with the adhesive of the APA. As far as can be understood, Kurz's bonding and impregnating composition is used to bond together other powders or particles, such as sand(col. 8, l. 27) to form a foundry mold. The better term for Kurz's addition is binding agent. Kurz's binding agent is not an adhesive or bonding agent between two members, as that term is used in the specification and is understood in the art. Kurz's Examples 1, 2, and 9 include mixing some composition and forming a mold from his bonded powder. Examples 4, 6, 7, and 10 are directed to forming either a particle board or coating on a board from his bonded powder. Example 8 is directed to a silica cement. Kurz provides a list at col. 7, l. 51 to col. 8, l. 9) of products obtained with his invention. None of the examples or listed products include members bonded together with the bonding composition of his invention. Kurz nowhere mentions using his silicon-augmented composition as an adhesive between two parts and certainly not to bonding silicon parts.

Finally, claim 1 requires the formation of a silica network. Claim 34 requires the formation of a glass. The invention is directed to forming bulk silicon structures. Kurz is silent on forming a glass and on converting to a silica network. Accordingly, Kurz's teachings cannot be obviously combined with the spin-on glass of the APA involving such a glass or silica network. The chemistry of Kurz's molding composite formed at low temperatures is irrelevant to the glass forming or silica bridging agent of the APA typically requiring higher temperature for a cured adhesive. Further, the two references are in different fields of endeavors, molds and

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particle boards vs silicon structures, and address different problems, powder binders in a water glass vs. bonding silicon parts.

As for the dependent claims, the Examiner relies on the specification for the availability of virgin poly powder. The commercial availability is irrelevant. The test for obviousness is whether it is obvious to combine the commercial virgin poly powder rather than some other silicon powder with the other elements of the adhesive. No suggestion has been provided for doing so. As for claim 7 and 8, while Kurz teaches particle sizes for silicon oxides, he is silent on the size of silicon powder. As for claim 35, Kurz teaches at col. 1, line 27 a sodium silicate (water-glass). This does not conform to a silicate glass as defined by the inventors and as taught in the APA.

The Examiner has rejected claims 9, 10, 17, and 37 under 35 U.S.C. §103(a) as being obvious over APA in view of Kurz and further in view of Canham et al. (U.S. Patent 6,832,716, hereafter Canham). These claims depend upon allowable claims and therefore should also be allowable. Further, Canham is not obviously combinable with the other art, in particular the SOG bonding of the APA. First, Canham does not teach grinding his silicon powder to fine sizes, as stated by the Examiner. Instead, as Canham describes at 53-57, the porous silicon nanocrystallites are formed on the surface of a silicon wafer by anodizing it. Admittedly, Canham uses this porous silicon layer to bond together two silicon parts although the bonding is done by passing a current through the porous silicon layer. At column 8, lines 42-49, Canham describes scraping the porous silicon from the anodized wafer and applying it between two other silicon parts and then passing a current through the powder-filled interface. However, it is not seen how Canham's porous silicon layer requiring a welding current can be combined with a silica forming agent needing annealing, two totally different joining techniques. The combination with Canham is fundamentally flawed because Canham is relying upon the porous nature of his silicon nanocrystallites to achieve his desired low-temperature bond and silicon porosity is irrelevant to either Kurz or the APA. The APA prior art teaches using SOG and annealing to bond silicon parts and Canham teaches using porous silicon nanocrystallites and electrical current to bond silicon parts. There is no suggestion for the advantage of combining the two disparate teachings.

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It is pointed out that claim 17 of the present rejection recites spin-on glass and an alcohol retardant, features not remotely found in Canham.

The Examiner has rejected claim 11 under 35 U.S.C. 103(a) as being obvious over the APA in view of Kurz and further in view of Nagano et al. (U.S. Publ. 2002/0149082) and Kosokai (U.S. Publ. 2002/0044404). This claim depends from an allowable claim and should therefore also be allowable. Further, the two added references are not readily combinable with the other art. Nagano teaches the fabrication steps of forming a semiconductor integrated circuit, apparently a memory device. At [0084] cited by the Examiner, Nagano teaches forming a silica insulating film by plasma CVD of TEOS. Nagano's description of silicon oxide particles is not understood although he may be describing the existence of molecules of SiO_2 in the plasma prior to their coating the integrated circuit. Nagano describes forming a film; he does not describe forming a powder of the claim. Kosokai describes forming an electrostatic chuck by sintering silicon carbide powder of size less than $0.1\mu\text{m}$. Silicon powder is not silicon carbide powder for reasons presented above to distinguish silicon from silicon nitride. Kosokai fails to teach the CVD formation of silicon powder. In any case, even if Kosokai taught such CVD silicon powder, there is no suggestion to add it to the SOG adhesive of the APA. Absent such a suggestion, claim 11 must be held additionally allowable.

The Examiner has rejected claims 16 and 17 under 35 U.S.C. 103(a) as being obvious over the APA in view of Kurz and further in view of Yamada et al. (U.S. Patent 5,945,475) and/or Beredjick (U.S. Patent 3,273,957). These claims depend upon a claim believed to be in allowable form and should therefore also be allowable. Yamada teaches the use of different alcohols as reaction retardants to increase the curability of the silicone release agent (col. 4, ll. 24, 25), a function that is the complete opposite of an adhesive. At col. 1, ll. 13-20, Yamada describes the need for retardants for long-term storage. This problem has not been evident from the APA art of SOG adhesives. That is, there is no suggestion in the art for adding a retardant to the SOG of the APA.. Yamada teaches nothing about retarding an adhesive during assembly. Beredjick teaches the use of water-insoluble long-chain alcohols to cover a body of water and retard its evaporation. This coating effect has absolutely nothing to do with curing adhesives of the APA and does not even involve any chemical reaction, only the creation of a physical barrier.

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Beredjick's list of evaporant retarders is totally inapplicable to the other applied art.

The Examiner's justification that such retardants are useful to slow the setting in order to allow time adjust the assembled parts has been impermissibly borrowed from the Applicant's description without citation to prior art.

A new set of claims 44-46 have been added.

In view of the above amendments and remarks, reconsideration and allowance of all claims are respectfully requested. If the Examiner believes that a telephone interview would be helpful, he is invited to contact the undersigned attorney at the listed telephone number, which is on California time.

Date:

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Respectfully submitted,



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